Subsurface Screening Clarification for RISC Technical Guide

This clarification applies to the February 12, 2001 RISC Technical Guide Chapter 3 Sections: 3.4.3, 3.4.4 and 3.4.5. The purpose of this document is to explain the default subsurface sampling guidelines (conditional procedures) of these sections. It is not intended to replace these sections, so the reader should consider the information in both documents for a thorough understanding of the procedures. Furthermore, the guidelines for surface soil screening procedures are not addressed in this clarification but may be found in Sections 3.4.2 and 3.4.4.

Background:

Default screening is an evaluation of the chemical of concern (COC) impact on two media: soil and ground water. Soil is screened to evaluate the *potential* toxic effects from direct contact and the *potential* for migration to ground water. Ground water is screened to evaluate whether it may have *already* been impacted from the source area. Accordingly, the screening procedures described in chapter 3 are broken out by media and discussed separately. However, during implementation, decisions must be made that integrate the two evaluations so that sampling can be performed as efficiently as possible.

The soil contaminant's potential to affect ground water in the future must be determined by performing subsurface soil screening for the migration to ground water (leaching) pathway. This entails sampling vertically beneath the source area until soil is encountered at contaminant concentrations less than the land use specific migration to ground water closure levels. This rationale assumes that the "bottom" of the contaminated soil has been evidenced, and that any contamination that may be present below this interval is at a concentration below the migration to ground water closure level, and therefore does not pose a threat for future leaching. If this is not a reasonable assumption based upon the site geology or other factors, then continued sampling will be necessary until the "bottom" of the contaminated soil area is evidenced. Either way, the "bottom" is represented by soil contaminant concentrations that are less than the land use specific migration to ground water closure level(s). Sampling procedures and Potential Exposure Concentration (PEC) determination is dependent on whether volatiles (detailed in chapter 3.4.3.1) or semivolatiles/inorganics (detailed in chapter 3.4.3.2) are being evaluated. If the resulting PEC is less than the closure level for migration to ground water, then the potential to affect the ground water is negligible. **However, that doesn't mean that the ground water was not previously impacted by the source area.**

SUBSURFACE SCREENING PROCEDURE:

Screening should be performed by using one of the 3 boring sampling options, and complying with the COC conditions, as follows:

COC Conditions:

Volatile Compounds:

May choose the Water Sample option (1) or the Volatile Field Screening option (3). However, if there is a preferential pathway to the ground water, or if highly permeable soil conditions exist in the vadose zone, then water samples must be collected from each source area boring if using the Volatile Field Screening option (3).

Nonvolatile Compounds:

May choose the Water Sample option (1) or the No Water Sample option (2). However, if there is a preferential pathway to the ground water, or if highly permeable soil conditions exist in the vadose zone, then Water Sample option (1) is required.

Boring Sampling Options:

1.) Water Sample **PEC = Weighted Average**

Sample the subsurface soil stratigraphically to a depth having concentrations below the land use closure level, and collect a ground water sample from each boring.

2.) No Water Sample **PEC = Weighted Average**

Sample the subsurface soil stratigraphically and demonstrate that at least 4 feet of subsurface soil has concentrations below the EQL. Here, the "4 feet" must be:

- comprised of at least 2 consecutive stratigraphy-based increments,
- below the lowest increment with concentrations above the EQL, and
- above the water table (seasonal high point).

Ground water sampling is not necessary.

3.) Volatile Field Screening **PEC = Increment Average**

1. Take 3 subsurface soil borings in areas with the highest suspected COC concentrations. In very small source areas fewer borings may be adequate as a nondefault.
2. Use a field instrument (such as a photo-ionization detector or flame ionization detector) to field-screen each 2-foot sampling increment to determine the highest reading within the boring.
3. Extend sampling to the water table (seasonal high point).
4. Collect a sample from the increment with the highest reading and submit it for laboratory analysis.
5. Collect a minimum of 1 ground water sample in the area most likely to be contaminated.

SUBSURFACE SCREENING PROCEDURE NOTES:

- For sites where the depth to ground water significantly diminishes the potential for ground water impact from volatile compounds, consultation with IDEM technical staff is recommended for appropriate sampling procedures.

- The "area most likely to be contaminated" is determined based upon soil concentrations, site geology, and knowledge of site history. Most sites will probably require more than one ground water sample based upon geology, adjacent ground water use(s), potential for multiple source areas, etc.

- When either boring sampling option is attempted, the depth of the closure level boundary and the depth of the detection boundary are unknown until lab results are evaluated, so the first round of sampling may be incomplete.

- Push probe technology is usually acceptable for ground water screening samples.

- Note that the soil screening investigation should be integrated with the ground water screening investigation for cost effectiveness. For example, collecting subsurface soil samples vertically to land use specific closure levels will necessitate collecting ground water samples for ground water screening. If ground water sampling is not desired (i.e. deep aquifer) then subsurface soils should be evaluated vertically to concentrations indicative of background or EQLs, not land use specific closure levels.

- Stratigraphy-based sampling must be followed per Section 3.4.3.2 anytime a weighted average is used.

- If multiple COCs are being evaluated, it may be necessary to sample several intervals from each boring depending upon site geology and the unique fate and transport characteristics of each COC.

POTENTIAL EXPOSURE CONCENTRATION (PEC) EVALUATION:

Soils (Vadose): There are two PEC options:
1) Weighted Average
2) Increment Average

If the PEC for each COC is smaller than the closure level, the subsurface is eligible for closure. Otherwise, the site must perform further action (ie, determine the nature and extent of soil contamination, or perhaps nondefault screening evaluation). Soil PECs are determined as follows:

Subsurface Soils:

Weighted Average:

Within each boring, the weighted average is calculated using Equation 7-5 (see Chapter 7 Section 7.1.5). The PEC for each COC is the highest of the weighted averages.

Increment Average (volatiles):

The increment average is determined after field screening as follows:

1. Select the highest lab concentration from each boring.
2. The PEC is the average of the concentrations. If more than three boring concentrations are available, average the three highest only.

Ground Water: If any COC is detected (above EQLs) in one or more ground water samples, the nature and extent of ground water contamination must be determined. Note that each sample concentration is a PEC.

1. If any COC has a concentration above detection (above EQLs) in one or more ground water samples, the site must perform further action (ie, determine the nature and extent of ground water contamination).
2. If all samples are below detection, and if the associated vadose zone is eligible for closure, the site is eligible for ground water closure.
3. If all samples are below detection, and the vadose zone is not eligible for closure, ground water monitoring may be required (see last note below).

PEC EVALUATION NOTES:

- Typically for volatiles, only one subsurface soil sample will be lab analyzed from each boring.

- In ground water screening, the PEC is simply each sample concentration. However, to determine further action, the PEC gets compared to the detection limit (EQL), not the closure level.

- Ground water monitoring may be required if the vadose soil exceeds closure levels. This monitoring may be discontinued once it has been demonstrated that the soil is not a potential source of ground water contamination. For example, a landfill requires continuous monitoring even though the ground water underneath may be currently unaffected.